The irregular CO_2 variation observed, especially from February to August, had a high correlation with the air mass exchange by synoptic scale weather disturbances.

(*Received December 6, 1989*)

MEASUREMENTS OF THE ATMOSPHERIC MINOR CONSTITUENTS AT SYOWA STATION, ANTARCTICA, IN 1986 (II) (ABSTRACT)

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Ground-based observations for the solar spectra were carried out to determine the column amounts of the minor constituents at Syowa Station, Antarctica in 1986. Solar spectra were measured within the spectral region from 400 to 5000 cm^{-1} by a Fourier transform infrared spectrometer (FTIR) whose resolution is 0.125 or 0.25 cm^{-1}. Column amounts of the gaseous constituents were determined by comparing observed equivalent widths with theoretical calculations.

The total H_2O obtained by FTIR observations agreed with the results of radiosonde soundings within the observational error. The temporal variation of the total O_3 obtained by FTIR observations was quite similar to the result obtained by the Dobson spectrometer. Rapid increase of the total O_3 accompanied by the stratospheric sudden warming was clearly observed on October 21. The temporal variations of the total N_2O, CH_4 and CO_2 were also found. We examined the relation between the variations of the total column amounts and the meteorological elements. Correlation between the total column amounts of N_2O, CH_4 and CO_2 and the thickness of tropospheric air mass was quite good.

(*Received October 30, 1989*)

SULFUR COMPOUNDS OF PHYTOPLANKTON ORIGIN IN THE ATMOSPHERIC BOUNDARY-LAYER (ABSTRACT)

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A box model was made to understand how dimethylsulfide (DMS or CH_3SCH_3), released from the ocean surface to the atmosphere, contributes to produce background aerosol particles

over the open ocean. Dimethylsulfide undergoes a photooxidation reaction with OH radical during the daytime, but with NO_3 radical during nighttime. This reaction has two pathways: hydrogen abstraction and OH addition to the sulfur atom. The oxidation of DMS produces sulfur dioxide (SO_2) and methanesulfonic acid (MSA or CH_3SO_3H) as intermediate products, and non-sea-salt sulfate (nss-SO_4^{2-}) as an end product. We considered the reaction processes in detail to obtain quantitatively the concentrations of SO_2, MSA and nss-SO_4^{2-}. The calculated concentrations are consistent with the observed values. It is concluded that DMS is a dominant source of aerosol particles included nss-SO_4^{2-} in the marine atmosphere. The calculation indicates that most nss-SO_4^{2-} must be produced by heterogeneous reactions of SO_2 through cloud droplets. Other processes, MSA oxidation and homogeneous SO_2 oxidation, are inefficient in producing abundant nss-SO_4^{2-}.

(Received November 28, 1989)

ON SO_2 MEASUREMENT IN THE OCEAN ATMOSPHERE (ABSTRACT)

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Seasonal change in content, size, and molecular state of aerosols containing sulfur suggested that geochemical cycle of sulfure in the Antarctic atmosphere is strongly controlled by long range transport of gaseous and particulate sulfur from the sub-Antarctic ocean. Sulfur dioxide gas is a key component for study on the geochemical cycle of various gases and particles containing sulfur.

A new type detector was developed to measure SO_2 in the ocean atmosphere where usually SO_2 content is at background level. This detector can measure SO_2 of 10 ppt level or lower in about 10 minutes, and will be useful to study behavior of SO_2 in a remote area which is not polluted by human activity.

(Received December 4, 1989)